

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1-12. (Canceled)

1 13. (New) A spin valve sensor comprising:

2 a first pinned layer having a first width and a first magnetic orientation;

3 a free layer, disposed above the first pinned layer and separated from the firsst pinned

4 layer by a spacer, the free layer having a second width disposed above the first pinned layer;

5 a ferromagnetic bias layer having the second width disposed above the free layer and a

6 second magnetic orientation orthogonal to the first magnetic orientation; and

7 an antiferromagnetic bias layer disposed above the ferromagnetic bias layer, the

8 ferromagnetic bias layer being exchange coupled to the antiferromagnetic layer;

9 wherein the second width is smaller than the first width.

1 14. (New) The spin valve sensor according to Claim 13, further comprising:

2 a second pinned layer having a third magnetic orientation anti-parallel to the first

3 magnetic orientation; and

4 a coupling layer disposed between the first and second pinned layers.

1 15. (New) The spin valve sensor according to Claim 14, wherein a thickness of

2 the first pinned layer is substantially equal to a thickness of the second pinned layer.

1 16. (New) The spin valve sensor according to Claim 15, further comprising an

2 anti-ferromagnetic (AFM) layer disposed adjacent to the first pinned layer.

1 17. (New) The spin valve sensor according to Claim 16, wherein a thickness of
2 the AFM layer establishes exchange coupling between the AFM layer and the first pinned
3 layer.

1 18. (New) The spin valve sensor according to Claim 16, wherein the first and
2 second pinned layers are self-pinned.

1 19. (New) A magnetic storage system, comprising:
2 a magnetic recording medium;
3 a spin valve sensor disposed proximate to the recording medium, the spin valve
4 sensor, including:
5 a first pinned layer having a first width and a first magnetic orientation;
6 a free layer, disposed above the first pinned layer and separated from the firsst
7 pinned layer by a spacer, the free layer having a second width disposed above the first pinned
8 layer;
9 a ferromagnetic biasing layer having the second width disposed above the free
10 layer and a second magnetic orientation orthogonal to the first magnetic orientation; and
11 an antiferromagnetic bias layer disposed above the ferromagnetic bias layer,
12 the ferromagnetic bias layer being exchange coupled to the antiferromagnetic layer;
13 wherein the second width is smaller than the first width.

1 20. (New) The magnetic storage system according to Claim 19, further
2 comprising:
3 a second pinned layer having a third magnetic orientation anti-parallel to the first
4 magnetic orientation; and
5 a coupling layer disposed between the first and second pinned layers.

1 21. (New) The magnetic storage system according to Claim 20, wherein a
2 thickness of the first pinned layer is substantially equal to a thickness of the second pinned
3 layer.

1 22. (New) The magnetic storage system according to Claim 21, further
2 comprising an anti-ferromagnetic (AFM) layer disposed adjacent to the first pinned layer.

1 23. (New) The magnetic storage system according to Claim 22, wherein a
2 thickness of the AFM layer establishes exchange coupling between the AFM layer and the
3 first pinned layer.

1 24. (New) The magnetic storage system according to Claim 22, wherein the first
2 and second pinned layers are self-pinned.